

A730

10



04-00

161294

SUPERFUND RECORDS

Atlantic Water
19203995400
1708

1/1/1912

1912

161294

10-2-1

IOWA GEOLOGICAL SURVEY

VOLUME XXI

ANNUAL REPORTS, 1910 AND 1911

WITH

ACCOMPANYING PAPERS

Prepared in Co-operation with the United States
Geological Survey

GEORGE F. KAY, STATE GEOLOGIST

JAMES H. LEES, ASSISTANT STATE GEOLOGIST



DES MOINES:

PUBLISHED FOR IOWA GEOLOGICAL SURVEY
1912

DES MOINES:

EMORY H. ENGLISH, STATE PRINTER
E. D. CHASSELL, STATE BINDER

an elevated tank and about 2 miles of mains, with 125 taps. The average daily consumption is 30,000 gallons.

Exira.—The village well at Exira (population, 787) is sunk in the river bottom to a depth of 28 feet, the last 2 feet of which is in gravel. It is 10 feet in diameter, is cased with brick, and fills with water within 8 feet of the surface. Approximately 8,000 gallons are used each day, but the well would easily provide several times this amount. When the waterworks were installed, a series of 2-inch wells were driven to the same bed of gravel, but were not as satisfactory as the large well used at present. The waterworks include a standpipe, three-fourths mile of mains, 10 fire hydrants, and about 35 service connections. The water is said to be very hard and is used by only a small portion of the inhabitants.

Kimballton.—The village of Kimballton (population, 271) has a system of waterworks which draws from a well and includes one-fifth mile of mains, 4 hydrants, and 12 taps.

CASS COUNTY.

BY HOWARD E. SIMPSON AND W. H. NORTON.

TOPOGRAPHY AND GEOLOGY.

Cass county is near the southwest corner of the state, well up the western slope of the Missouri-Mississippi divide.

Topographically it is a drift plain, sloping gently southwestward, cut in every direction by the channels of minor streams. Nishnabotna and Nodaway rivers flow southwestward across it in wide, deep, preglacial valleys, which they have cut in the underlying rock and recut in the soft drift cover. The upland slopes to the north and east grade into gently rolling prairies; those to the south and west show more complete dissection and more mature drainage than those on the eastern side of the divide.

In the valleys of Nishnabotna and Nodaway rivers the drift rests on Carboniferous strata, here chiefly a series of heavy shales alternating with thinner beds of hard limestone (Missouri stage). Over a large part of the county the drift rests on Cretaceous sandstone, known as the Dakota, which rests unconformably on the Carboniferous. On the uplands the drift has an average thickness of perhaps 200 feet, and consists of heavy beds of till overlain by a comparatively thin mantle of loess. Heavy deposits of sand and gravel are found in the bottoms of the larger valleys.

UNDERGROUND WATER.

SOURCES.

The water-bearing beds utilized in Cass county are the alluvial sands and gravels, loessial sands, drift sands, the Dakota sandstone, and the limestone of the Missouri stage.

In few parts of Iowa can so satisfactory supplies of water be obtained at so slight cost as in the gravel-filled valleys of the southwestern part of the state. The sands and gravels that fill the valley bottoms of Nishnabotna and Nodaway rivers and their larger tributaries to depths of 50 to 100 feet afford an inexhaustible supply of good water at depths ranging from 20 to 100 feet. The water is generally obtained by driving 1½-inch pipe shod with a three-foot point covered with No. 60 gauze mesh. The expense of such a well complete, with pump, is \$15 to \$25. Rarely is the sand so fine as to fill the point and thus destroy the well. When it does, the pipe may be drawn, the point cleaned, and the whole again driven.

On the uplands, especially in the eastern part of the county, where the loess is comparatively thin, many shallow wells obtain water from sands under the loess. In the western part, where the loess is thicker, many wells do not pass through the loess, but depend entirely on the slow seepage from this porous clay. Wells in the loess and its underlying sands are very likely to be contaminated by drainage from the surface.

In all parts of the county an excellent supply of water may be obtained from the gravels at the base of the drift at depths of 100 to 225 feet. The head is relatively low but strong. Many wells obtain a scant but wholesome supply from seepage and from local sand layers that lie at different depths within the till. Where cultivation and artificial drainage have lowered the ground-water level, dug wells have been dug deeper, and bored wells filled with large tiling or sewer pipe extending down to lower gravels of the drift are very common. The gravel between the drift sheets also yields water.

The Dakota sandstone is an aquifer of the first order and rarely fails to yield excellent water at depths ranging from 150 to 300 feet.

The limestone of the Missouri stage affords a scant supply of hard water that is seldom utilized. It is important only on the slopes of the larger valleys, where the Dakota sandstone been eroded away. It is rarely reached within 250 feet of the surface.

CITY AND VILLAGE SUPPLIES.

Anita.—The public water supply of Anita (population, 1,118) is obtained from a 207-foot well, which draws excellent water from the Dakota sandstone. It is somewhat hard and is said to pit the boilers. The water is pumped by gasoline engine into elevated tanks, from which it is delivered over the entire town under direct pressure of 50 pounds.

Atlantic.—The public supply of Atlantic (population, 4,560) is owned by the city. It is drawn from 30 drilled and driven wells, ranging in depth from 52 to 86 feet and in diameter from four to six inches, located in the "bottoms" of Nishna-botna river. The drilling is done inside a tube, the well being pumped out and the tube driven a few inches or feet at a time until it reaches a suitable aquifer, into which drilling is continued a foot or two to form a collecting pocket. A Cook strainer is pushed to the bottom and fixed on the end of the driven pipe. The wells are connected with T's to air chambers and so connected in groups and series that any individual or group may

be cut off, the caps may be removed, and the sand pumped out at will. One of the 30 wells never produced at all, and this well and two others whose casings were broken in cleaning have been cut off.

DAKOTA ?
The water-bearing bed, a sharp white sand with some gravel, lies 50 to 86 feet below the surface. Above it are many layers of clay silt alternating with beds of sand and gravel, some of which are water bearing. Several years ago fifty three-inch drive points penetrating some of these gravel layers were utilized, but they were abandoned on account of the insufficiency of the supply. The series could be pumped dry in about one hour.

When not pumped the water in the present wells ordinarily stands 13 feet below the surface, but the level varies with weather and rainfall. The wells respond within 24 hours to heavy rainfall or rise of river near by, but the water level lowers much more slowly than it rises. Under emergency pumping the water level has been lowered to 28 feet below the surface.

The water in these wells is distributed by direct pressure through 13 miles of mains to 104 fire hydrants and more than 1,200 taps. Four-fifths of the inhabitants of the city are supplied. The daily use is 500,000 gallons; the daily capacity of the plant is 2,500,000 gallons. The water pumped at night in excess of that used overflows into a reservoir where it is held in reserve for emergency. In case of fire the water from this pond is forced directly into the mains and the pressure is raised from 80 to 155 pounds. The contamination of the city mains with stale water from the pond is the unsatisfactory feature of this otherwise excellent system.

The water has been used in boilers and for manufacturing purposes by the Chicago, Rock Island & Pacific Railway, the electric light company, laundries, canning factories, starch factory and others, and, is on the whole, very satisfactory. It precipitates, on standing, a small quantity of the red sediment that is commonly found in drift-gravel waters, and some firemen find it helpful to use a small amount of boiler compound.

A prospect hole, drilled in 1888 by Rust Artesian Well Company of Ithaca, New York, for the Atlantic Coal & Mining Company, goes down 1,310 feet. The elevation of the curb above sea level is 1,150 feet. No record was preserved of water-bearing beds, as the contract required a dry hole at all times. It is said that drilling was stopped because the pressure became so great that it caused the casing to collapse. The hole is situated a short distance east of the railway station.

Samples of the drillings of this boring were placed at the disposal of the Iowa Geological Survey by Seth Dean of Glenwood. In the following record of strata determinations those in quotations are supplied by Mr. Dean; those marked with a star are from the manuscript record of Mr. E. H. Lonsdale.

Record of strata in deep well at Atlantic.

	Thickness	Depth
	Feet	Feet
Pleistocene (no sample) -----	1257	1257
Carboniferous:		
Pennsylvanian (725 feet thick; top, 1,025 feet above sea level)---		
"Shale, blue"-----	35	160
"Shale, gravelly"-----	35	195
"Shale, red and blue, gravelly"-----	5	200
"Limestone, gray, sandy"-----	15	215
"Shale, red and blue, with soapstone"-----	5	220
"Shale, gravelly"-----	5	225
"Shale purple, dark drab and green, fine, unctuous; with pebbles (five limestone, one vitreous sandstone, one coal)"-----	35	260
"Shale, gravelly"-----	50	310
"Clay, mottled red and blue"-----	30	340
"Shale, blue"-----	15	355
"Shale, red and blue, with gravel"-----	5	360
"Shale, blue, with slate"-----	5	365
"Sandstone and shale"-----	50	415
"Slate, black; soapstone, blue and green"-----	5	420
Shale, varicolored, green and reddish; fissile, practically noncalcareous	10	430
"Sandstone"-----	5	435
"Shale"-----	15	450
"Shale and limestone"-----	15	465
"Shale, varicolored, green and reddish; fissile, practically noncalcareous"-----		
"Clay and soapstone"-----	15	480
"Sandstone"-----	25	505
"Shale, blue"-----	12	517
Shale, dark gray, very finely laminated, somewhat calcareous-----	23	540
"Sandstone, or sandy limestone"-----	10	550
Shale, dark gray-----	15	565
Shale, dark brown-gray, noncalcareous, arenaceous, pyritiferous-----	20	585
Sandstone, brown, highly ferruginous-----	5	590
"Sandstone"-----	10	600
"Shale, sandy"-----	30	630
"Sandstone, very fine"-----	30	660
"Shale and slate"-----	15	675
Shale, iron gray, finely laminated, noncalcareous-----	10	685
"Sandstone, white, very fine"-----	10	695
*Clay, blue, with gravel-----	15	710
*Shale, sandy-----	15	725
*Sandstone-----	5	730
Shale, finely arenaceous, ocherous; some black-----	10	740
Shale, black, carbonaceous-----	10	750
*Shale, blue, and slate-----	10	760

Record of strata in deep well at Atlantic—Continued.

	Thickness	Depth
	Feet	Feet
*Shale, yellow, gravelly	40	800
Sandstone, gray, of finest grain, with much black shale; samples at 800 and 815	25	825
*Limestone sandy	5	830
*Sandstone, brown	5	835
*Sandstone, gray	15	850
Mississippian (420 feet thick; top, 800 feet above sea level)		
Limestone, white, nonmagnesian; white chert constitutes the bulk of the sample	35	865
Limestone, blue-gray, argillaceous; quartzose residue, with large fragments of dark shale; probably from above	75	900
Limestone, yellow-gray; sample chiefly dark brown flint with some chalcadonic silica; a very little quartz sand	5	965
Flint, brown-gray, calcareous; some chalcadonic silica; much shale in fragments	10	975
Flint, gray and black chalcadony; drusy quartz; some shale	5	980
Flint, brown, calcareous; some chalcadony; a little shale	5	985
Flint and chalcadony; 5 samples; drillings largely milk-white, translucent chalcadony, with brown calcareous flint and some limestone	45	1,030
Limestone, nearly white; much white chert; 2 samples	15	1,045
Chalcadony and flint; drillings remaining after original washing made up of chalcadonic silica and blue-gray and yellow siliceous fragments which effervesce in cold dilute hydrochloric acid, but do not dis-aggregate; pure limestone practically absent	30	1,075
Shale and flint; shale, blue-gray, somewhat calcareous	5	1,080
Limestone, soft, light yellow-gray; with silica as above, and some fragments of shale; 4 samples	40	1,120
Limestone, brown; much white chert	5	1,125
Limestone, lighter colored; drillings chiefly chert; only finest sand is limestone and even this is siliceous	5	1,130
Limestone, light yellow, nearly pure; considerable shale in small fragments	5	1,135
Limestone; as above; much chalcadony and chert	5	1,140
Limestone, white, chalky, and light yellow	5	1,145
Chert; drillings of chert and chalcadony; at 1,145 feet a few rounded grain of crystalline quartz and particles of fine grained sandstone; 4 samples, all of which in mass effervesce freely in acid	25	1,170
Flint; black, yellow, and red flint and jasper, with sand of rounded grains of quartz; fragments of limestone, chert, and chalcadony	10	1,180
Limestone, blue-gray, cherty, and argillaceous	10	1,190
Chert, white and brown; some shale in sample	10	1,200
Limestone, cherty; gray in mass	25	1,225
Limestone; siliceous material constitutes one-tenth of sample by weight	20	1,245
Chert and shale, buff; chert effervescent; shale pink, in fine grains, but slightly calcareous	10	1,255
Limestone, highly arenaceous and siliceous; chert and chalcadony; two-fifths of sample by weight insoluble	5	1,260
Sandstone, highly calciferous; limestone arenaceous; quartz in minute angular particles; white and yellow-gray; 2 samples	10	1,270
Devonian? (40 feet penetrated; top, 120 feet below sea level):		
Shale, fine, light gray, calcareous	15	1,285
Limestone, cream-yellow, rather hard; in angular sand	25	1,310

Griswold.—The town of Griswold (population, 949) is supplied from a 200-foot drilled well which draws its water from drift within 70 feet of the surface. A standpipe is used for storage and the water is distributed through $1\frac{1}{4}$ miles of mains at pressure varying from 35 to 100 pounds.

Lewis.—The water supply of Lewis (population, 603) is chiefly from wells ranging in depth from 40 to 70 feet. The public supply is drawn from a dug well seven feet in diameter and 68 feet deep, in which the water stands 50 feet below the surface. The well ends in sand and gravel overlain for almost the entire depth by clay. The water is distributed from an elevated tank under direct pressure of 43 pounds through nearly one mile of mains.

A well drilled on a valley slope in 1900 as a prospect for coal and artesian water passed through seven feet of Dakota sandstone, probably the edge on the valley side, and continued down through Coal Measures to a depth of 562 feet, where it was abandoned. An excellent spring flows from the sandstone outcrop in the bluffs bordering Nishnabotna river and furnishes water for drinking and bathing at a summer resort established by Mr. D. W. Woodward.

Marne.—At Marne (population, 266) domestic wells are sunk 30 to 60 feet to sand layers in the drift. Many of the stock wells, demanding a larger supply, are sunk to the lower gravel layers, about 200 feet. The city well supplies an elevated tank from which water is distributed by direct pressure of 25 pounds for fire, street, and domestic purposes.

Massena.—At Massena (population, 490) there are few deep wells, most of the people relying on bored wells 20 to 60 feet deep. The city has no other supply than that afforded by open cisterns and hand pumps.

WELL DATA.

Information in regard to some of the typical wells in Cass county is presented in the following table:

Typical wells of Cass County.

Owner	Location	Depth	Depth to rock	Source of supply	Head below curb	Remarks: (Logs given in feet)
T. 76 N., R. 35 W. (Franklin). R. R. Bell	SW. $\frac{1}{4}$ sec. 24	189		Sand	179	Upper water bed at 40.
T. 76 N., R. 37 W. (Washington). W. B. Berry	NE. $\frac{1}{4}$ sec. 7	226		Fine sand	150	Very hard water.
W. J. Copeland	SE. $\frac{1}{4}$ sec. 11	150		Drift sand		
Julius Kirkpatrick	NE. $\frac{1}{4}$ sec. 10	180		do	130	
T. 74 N., R. 37 W. (Pleasant). Town of Griswold	Griswold	100	100	"Blue rock"	70	Valley.
Town	do	200	70	Drift sand		No water below drift
T. 75 N., R. 36 W. (Bear Grove): Sam Deverns	6 miles south of Atlantic.	365	100	No water		In limestone and shale.
T. 76 N., R. 36 W. (Grove). F. O. Schain	SE. $\frac{1}{4}$ sec. 29	110		Drift sand	80	Good strong well.
Bert Frost	NE. $\frac{1}{4}$ sec. 19	218		Sand	163	
Polk Byrd	NE. $\frac{1}{4}$ sec. 6	150	124	Sandstone (Dakota).		Drift, 124; white sandstone, 4; red sandstone, 18; shale, 4.
O. V. Wilder	5 miles south of Atlantic.	128	128	Drift sand and gravel.		Abundant water in sand and gravel over limestone.
T. 77 N., R. 35 W. (Benton). Thomas Kelly	4 miles southeast of Braydon.	295	245	Sandstone (Dakota).	220	Strong well, good water.
T. 77 N., R. 37 W. (Brighton). L. S. Allen	NW. $\frac{1}{4}$ sec. 30	247	234	do	166	Limestone (Missouri) at 247 feet.
T. 77 N., R. 36 W. (Pymosa). Winfield Wilbur	7 miles north of Atlantic.	283	250	Sandstone (Missouri).	200	Water in crevice of limestone.
T. 75 N., R. 34 W. (Massena). W. S. Shields	NW. $\frac{1}{4}$ sec. 32	324	178	No water		In limestone (Missouri).
T. 74 N., R. 34 W. (Victoria). John Holste	NE. $\frac{1}{4}$ sec. 20	240	207	do		Do.
T. 77 N., R. 34 W. (Grant). Town	Anita	207	171	Sandstone (Dakota).	171	Hilltop; Pleistocene, 171; Dakota sandstone, 86; limestone (Missouri) at 207 feet.
T. 75 N., R. 37 W. (Cass). Town	Lewis	562	70	Limestone (Missouri).		Hillside; Pleistocene, 70; Dakota sandstone, 7; Carboniferous, 485. Water in limestone at 82. Abandoned because of caving; drilled for coal.

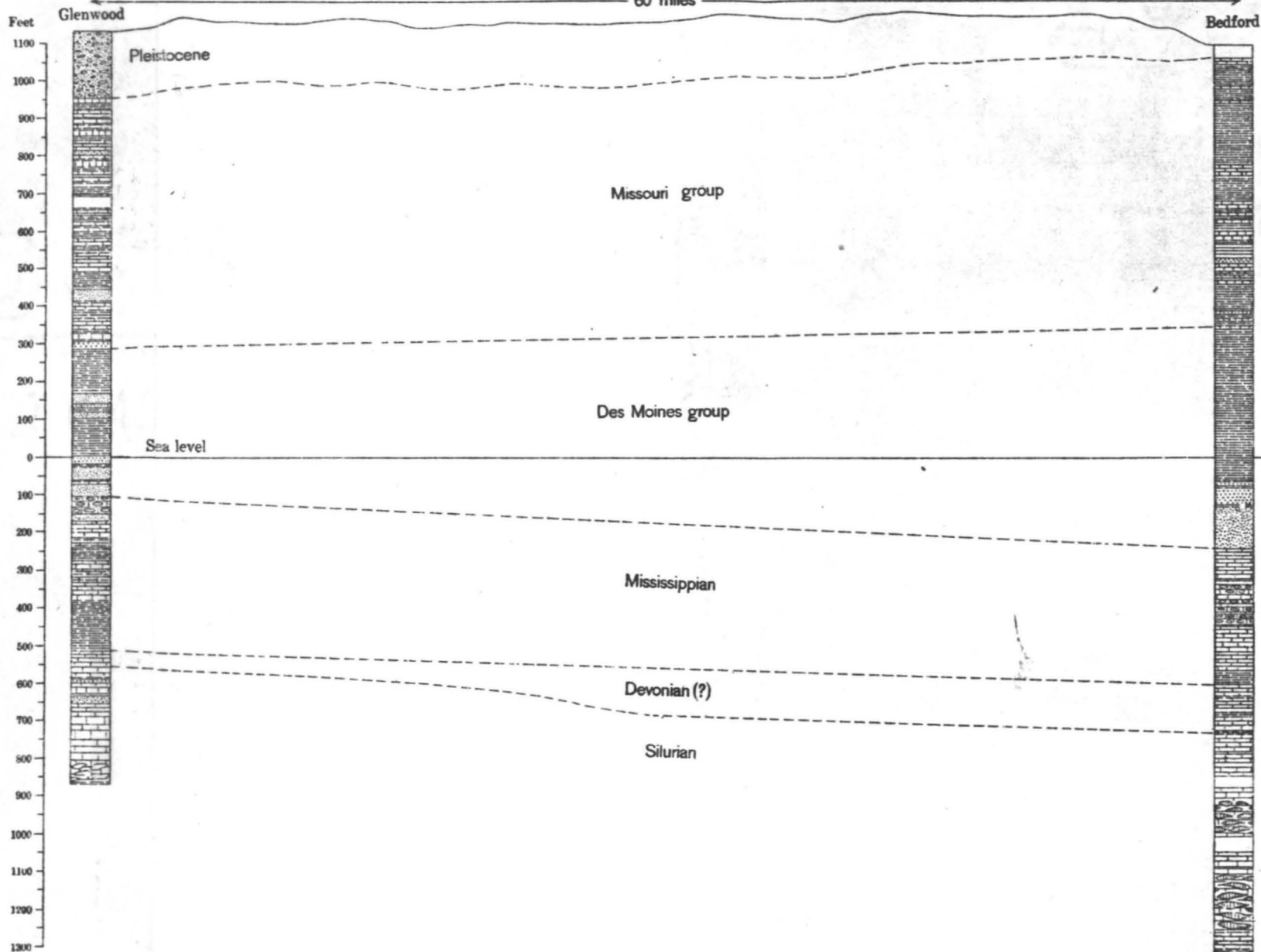
NW

SE

IOWA GEOLOGICAL SURVEY

PLATE XVIII

60 miles



GEOLOGIC SECTION BETWEEN BEDFORD AND GLENWOOD, IOWA
By W. H. Norton